

Claims

1. In an electronic device that accepts hand drawn entries, a method for recognizing the hand drawn entries, comprising the steps of:

- 5 receiving each hand drawn entry as a plurality of sequential points;
 performing at least one of the following steps in any order:
 measuring the size of the hand drawn entry and comparing the
size of the hand drawn entry to a size range;
 determining the existence and number and angles of vertices in a line
10 which could be drawn between said points;
 comparing the results of said at least one step to a set of rules, a
favorable comparison leading to conclusive identification of the hand drawn
entry as an identified shape.

- 15 2. The method for recognizing hand drawn entries of claim 1, wherein
said at least one step includes determining the distance between said vertices.

3. The method for recognizing hand drawn entries of claim 1, wherein
said at least one step includes performing a Wide Pen Test.

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4. The method for recognizing hand drawn entries of claim 1, wherein
said at least one step includes performing a test for Golden Clues.

5. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes the step of excluding identification of shapes that do not conform to said set of rules.

5 6. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes excluding identification of shapes that do not conform to said set of rules regarding size.

7. The method for recognizing hand drawn entries of claim 1, further
10 including a plurality of hand drawn entries, each of said hand drawn entries being analyzed individually.

8. The method for recognizing hand drawn entries of claim 1, further
including a plurality of hand drawn entries, said lines being agglomerated and
15 analyzed as a single entity.

9. The method for recognizing hand drawn entries of claim 1, further
including a plurality of hand drawn entries of different colors, said set of rules
including color rules to determine agglomeration of said entries as a single
20 entity.

10. The method for programming an electronic device of claim 1, further
including the step of using arrow logics to establish attributes of said identified
shape.

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11. The method for programming an electronic device of claim 1, further including the step of creating an info window for at least one of said identified shapes, said info window enabling setting and altering attributes for said at least one identified shape.

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12. The method for recognizing hand drawn entries of claim 1, further including the step of carrying out further analytic tests to determine the specific object type.

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13. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes determining the angular trend of said plurality of sequential points.

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14. The method for recognizing hand drawn entries of claim 13, further including the step of excluding identification of shapes that do not conform to said set of rules regarding angular trend.

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15. The method for recognizing hand drawn entries of claim 1, wherein said step of measuring the size includes the step of generating a minimum bounding rectangle to circumscribe the hand drawn entry.

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16. The method for recognizing hand drawn entries of claim 15, further including the step of determining the size of said bounding rectangle, and comparing said size to size rules for at least one identifiable shape.

17. The method for recognizing hand drawn entries of claim 3, wherein said wide pen test includes the step of generating a minimum bounding rectangle to circumscribe the hand drawn entry.

5 18. The method for recognizing hand drawn entries of claim 17, further including the step of generating at least one identifiable geometric shape inscribed in said bounding rectangle, and comparing the coincidence of said points of said hand drawn entry with a wide pen stroke defining at least one identifiable geometric shape.

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19. The method for recognizing hand drawn entries of claim 18, wherein said wide pen stroke is selected to be a predetermined width, and further including the step of adaptively altering said predetermined wide pen stroke width.

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20. The method for recognizing hand drawn entries of claim 19, wherein the identifiable geometric shape yielding a degree of coincidence greater than a predetermined coincidence threshold is determined to be the shape of said hand drawn entry.

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21. The method for recognizing hand drawn entries of claim 20, further including the step of adaptively altering said coincidence threshold.

22. The method for recognizing hand drawn entries of claim 20, further including the step of determining the angular trend of said hand drawn entry.

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23. The method for programming an electronic device of claim 11, including the step of drawing at least one arrow from an attribute shown in an info window to at least one identified shape outside said info window.

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24. The method for recognizing hand drawn entries of claim 1, further including the step of determining the angular orientation of said hand drawn entry with respect to a reference orientation.

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25. The method for recognizing hand drawn entries of claim 24, further including the step of excluding identification of shapes that do not conform to said set of rules regarding angular orientation.

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26. The method for recognizing hand drawn entries of claim 1, further including the step of determining the proximity of said hand drawn entry to another graphic object.

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27. The method for recognizing hand drawn entries of claim 26, further including the step of excluding identification of shapes that do not conform to said set of rules regarding maximum proximate distance to said another graphic object.

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29. The method for recognizing hand drawn entries of claim 1, further including the step of identifying a portion of said hand drawn entry drawn more slowly than other portions of said hand drawn entry.

30. The method for recognizing hand drawn entries of claim 29, further including the step of determining the existence of a vertex in said portion of said hand drawn entry, and calculating the vertex angle.

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31. The method for recognizing hand drawn entries of claim 29, wherein said portion of said hand drawn entry is identified by storing and analyzing time of entry data of said plurality of points.

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32. The method for recognizing hand drawn entries of claim 30, wherein if a vertex angle in said portion of said hand drawn entry is substantially orthogonal, said golden clue test provides increased potential for identifying a rectilinear shape.

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33. The method for recognizing hand drawn entries of claim 30, wherein if a vertex angle in said portion of said hand drawn entry is substantially non-orthogonal, said golden clue test provides increased potential for exclusion of all rectilinear shapes.

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34. The method for recognizing hand drawn entries of claim 30, wherein if a pair of vertex angles in said portion of said hand drawn entry are substantially orthogonal, proximate, and opposite, said golden clue test provides increased potential for identification of a folder shape.

35. The method for recognizing hand drawn entries of claim 30, wherein said golden clue test includes identifying a first-drawn portion of said hand drawn entry, determining the existence of a vertex in said first drawn portion of said hand drawn entry, and calculating the vertex angle.

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36. The method for recognizing hand drawn entries of claim 35, wherein if a vertex angle in said first-drawn portion of said hand drawn entry is substantially orthogonal, said golden clue test provides increased potential for identification of rectilinear shapes.

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37. The method for recognizing hand drawn entries of claim 35, wherein if a vertex angle in said first-drawn portion of said hand drawn entry is substantially non-orthogonal, said golden clue test provides increased potential for exclusion of all rectilinear shapes.

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38. The method for recognizing hand drawn entries of claim 1, further including a slice step of identifying three of said points that are adjacent and spaced apart greater than a minimum pixel length distance, constructing an angle defined by said three points, measuring the constructed angle, and reiterating said slice step in serial fashion with consecutive points of said hand drawn entry to include substantially all said points of said hand drawn entry.

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39. The method for recognizing hand drawn entries of claim 38, further including the step of storing the angle measurement of a slice when it exceeds a predetermined angle threshold.

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40. The method for recognizing hand drawn entries of claim 39, further including the step of reducing said predetermined angle threshold whenever said reiterated slice step yields an angular measurement less than said predetermined angle threshold.

41. The method for recognizing hand drawn entries of claim 39, wherein if an angle measurement of a given slice step exceeds said predetermined angle threshold, and the angle measurement of the subsequent slice step is less than said predetermined angle threshold, a vertex is identified in the portion of said hand drawn entry containing said given slice step.

42. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes detecting and storing the first pen down location of said hand drawn entry.

43. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes detecting and storing the direction of the pen stroke of said hand drawn entry.

44. The method for recognizing hand drawn entries of claim 1, wherein said at least one step includes measuring the speed of drawing said hand drawn entry.

45. The method for recognizing hand drawn entries of claim 44, wherein said speed of drawing is determined by detecting the point-to-point spacing between said sequential points of said hand drawn entry, the point-to-point spacing varying directly with said speed of drawing.

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46. The method for recognizing hand drawn entries of claim 44, wherein said speed of drawing is determined by recording the time of entry of each of said sequential points, and calculating the speed of drawing from said time of entry data.

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47. The method for recognizing hand drawn entries of claim 1, further including the step of weighting the importance of the comparison of results to said set of rules, whereby some comparison results are accorded more importance in determining the identified shape.

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48. The method for recognizing hand drawn entries of claim 1, wherein said results of said at least one step include numerical parameters that correspond to characteristics of said hand drawn entry, said numerical parameters being compared to stored magic number values.

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49. The method for recognizing hand drawn entries of claim 48, wherein said magic number values are selectively varied in response to inconclusive comparisons to said set of rules.

50. The method for recognizing hand drawn entries of claim 49, wherein said magic number values can be selectively varied by user input.

51. In an electronic device that accepts hand drawn entries, a method for
5 programming of said device, including the steps of:

using an input device to freehand draw at least one recognizable hand
drawn entry;

performing at least one of the following steps in any order:

converting said at least one recognizable hand drawn entry into a
10 functional device having a function that may be carried out by said electronic
device;

converting said at least one recognizable hand drawn entry into an action
that may be carried out by said electronic device.

15 52. The method for programming of claim 51, further including the step
of assigning attributes to said recognizable hand drawn entry, said attributes
defining said hand drawn entry as a functional device.

53. The method for programming of claim 51, further including the step
20 of assigning attributes to said at least one recognizable hand drawn entry, said
attributes comprising at least one action that may be carried out by said
electronic device.

54. The method for programming of claim 51, further including the step
25 of creating an info window for said at least one recognizable hand drawn entry,

said info window enabling setting and altering attributes for said at least one hand drawn entry.

55. The method for programming of claim 51, further including the step
5 of creating an info window for determining object recognition tests to identify said at least one recognizable hand drawn entry.

56. The method for programming of claim 51, further include the step
of joining a plurality of functional devices in a utilitarian sequence.

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57. The method for programming of claim 56, wherein said utilitarian sequence receives a designated input and produces a desired output.

58. The method for programming of claim 56, wherein said joining step
15 includes the step of drawing at least one line extending to and intersecting said functional devices in said sequence.

59. The method for programming of claim 58, further including the step
of selecting a line color for said at least one line, said functional devices being
20 drawn in object colors, the coincidence of said line color and said object colors enabling the joining of said line and objects.

60. The method for programming of claim 51, further including the step
of grouping a plurality of selected functional devices for action in common.

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61. The method for programming of claim 60, wherein said grouping step includes the step of drawing a line that substantially circumscribes said selected functional devices.

5 62. The method for programming of claim 60, wherein said grouping step includes the step of drawing a line that substantially intersects said selected functional devices.

10 63. The method for programming of claim 60, wherein said grouping step includes the step of drawing a bracket that substantially spans said selected functional devices.

15 64. The method for programming of claim 51, further including the step of agglomerating at least two of said hand drawn entries into a single object.

 65. The method for programming of claim 64, further including the step of enabling agglomeration only between at least two of said hand drawn entries having a common color.

20 66. The method for programming of claim 51, further including the step of applying functional parameters to a recognizable hand drawn entry by drawing a line from a functional device having defined functional parameters to a recognizable hand drawn entry lacking functional parameters.

67. The method for programming of claim 51, further including the step of assigning attributes to said at least one recognizable hand drawn entry by inputting text.

5 68. The method for programming of claim 51, further including the step of assigning attributes to said at least one recognizable hand drawn entry by making entries in an info window.

10 69. The method for programming of claim 51, further including the step of assigning attributes to said at least one recognizable hand drawn entry by inputting at least one verbal statement.

15 70. The method for programming of claim 51, further including providing an info window for each recognizable hand drawn entry, said info window enabling setting and altering attributes of said at least one recognizable hand drawn entry.

20 71. The method for programming of claim 70, wherein said info window attributes include the aesthetic properties of said recognizable hand drawn entry.

72. The method for programming of claim 70, wherein said info window attributes include the definition of recognizable hand drawn entry.

73. The method for programming of claim 70, wherein said info window attributes include the action of said recognizable hand drawn entry.

74. The method for programming of claim 70, wherein said info window
5 attributes include the assignment of said recognizable hand drawn entry.

75. The method for programming of claim 74, wherein said assignment sets forth the ability of said recognizable hand drawn entry to acquire the attributes of another recognizable hand drawn entry that is disposed within a
10 predetermined proximity.

76. The method for programming of claim 51, further including inputting a plurality of said recognizable hand drawn entries.

77. The method for programming of claim 76, further including the step
15 of connecting said plurality of recognizable hand drawn entries.

78. The method for programming of claim 77, wherein said connected recognizable hand drawn entries receive a selected input and produce a desired
20 output.

79. The method for programming of claim 77, wherein said step of connecting includes drawing a line that extends to each of said plurality of recognizable hand drawn entries.

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80. The method for programming of claim 76, further including the step of grouping said plurality of recognizable hand drawn entries for action in common.

5 81. The method for programming of claim 80, wherein said grouping step includes drawing a bracket that encompasses said plurality of recognizable hand drawn entries.

10 82. The method for programming of claim 51, further including the step of using arrow logics to establish attributes of said at least one recognizable hand drawn entry.

15 83. The method for programming of claim 51, further including the step of applying a physical control device on-screen to said at least one functional device, said physical control device enabling a user to input variable control values to said at least one functional device.

20 84. The method for programming of claim 83, wherein said physical control device comprises a crack-and-peel controller.

 85. The method for programming of claim 51, wherein said device includes a telephone, and further including the step of selective call blocking.

25 86. The method for programming of claim 85, including the step of assigning telephone numbers to a subset of said functional devices, drawing a

symbol representing the call blocking function, and drawing an arrow from said symbol to one of said subset of functional devices to block calls from the telephone number represented by said one functional device.

5 87. The method for programming of claim 51, wherein said device includes a telephone, and further including the step of selective call answering.

 88. The method for programming an electronic device of claim 87,
including the step of assigning telephone numbers to a first subset of said
10 functional devices, assigning different answering messages to a second subset
of said functional devices, and drawing an arrow from one of said second
subset of functional devices to one of said first subset of functional devices to
assign the respective answering message to a call from a respective telephone
number.

15 89. The method for programming an electronic device of claim 51,
wherein said device displays a signal waveform, and said functional device
comprises a chop tool juxtaposed over said signal waveform, said signal
waveform being cut off at the point of intersection of said waveform and said
20 chop tool.

 90. The method for programming of claim 76, wherein said plurality of
recognizable hand drawn entries comprise an audio control panel.

91. The method for programming of claim 76, further including the step of conveying the attributes of one functional device to another functional device by drawing an arrow from said one functional device to said another functional object.

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92. The method for programming of claim 51, wherein said recognizable hand drawn entry comprises an arrow, and further including the step of recognizing the start point and end point of said arrow.

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93. The method for programming of claim 92, wherein said arrow is assigned the function of conveying attributes from a recognizable hand drawn entry proximate to said starting point to a recognizable hand drawn entry proximate to said end point.

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94. The method for programming of claim 92, wherein said arrow is assigned the function of copying a recognizable hand drawn entry proximate to said starting point to a location proximate to said end point.

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95. The method for programming an electronic device of claim 11, including the step of drawing at least one arrow to an attribute shown in an info window from at least one identified shape outside said info window.

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96. The method for recognizing hand drawn entries of claim 40, wherein the maximum total reduction of said predetermined angle threshold is determined by a user-defined parameter.

97. The method for programming of claim 51, further including the step of creating an info window for said at least one recognizable hand drawn entry, each info window storing parameters determining the function of said at least one recognizable hand drawn entry.

98. The method for programming an electronic device of claim 54, including the step of drawing at least one arrow to an attribute shown in an info window from at least one identified shape outside said info window.

99. The method for programming an electronic device of claim 54, including the step of drawing at least one arrow from an attribute shown in an info window to at least one identified shape outside said info window.

100. The method for programming an electronic device of claim 51, wherein said device displays a graphic object, and said functional device comprises a chop tool juxtaposed over said graphic object, said graphic object being cut off at the line of intersection of said graphic object and said chop tool.

101. The method for programming of claim 91, further including the step of modifying the attribute conveyed by an arrow by entering a text command proximate to said arrow.

102. The method for programming of claim 92, further including the step of providing an info window for said arrow, said info window enabling setting and modifying attributes of said arrow.

- 5 103. The method for programming of claim 70, wherein said info window attributes include the function of a recognizable hand drawn entry.

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